

Altair

Subject: 9th BIOLOGY

Class: Scientific

Investigation II

Date: March 11

2011



Teacher's notes

Objectives

Vocabulary

Link and Learn

Prepared by

Accuracy

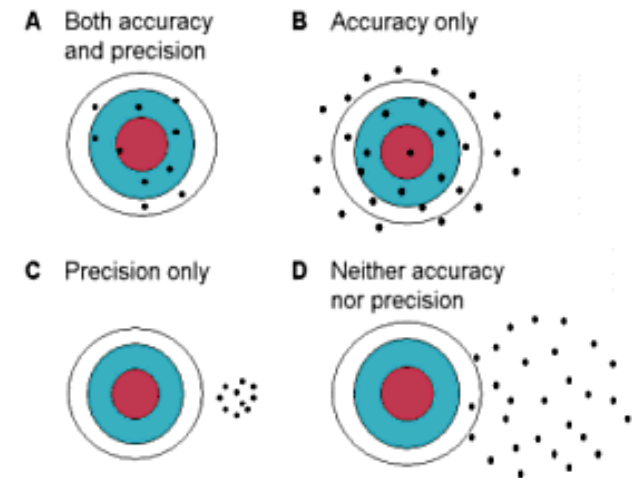
Accuracy refers to the *agreement* of the measurement and the true value and does *not* tell you about the quality of the instrument.

Precision

Precision refers to the *repeatability* of the measurement.

It does not require to know the correct or true value.

<http://goo.gl/oilUQ>



<http://goo.gl/Qnzpd>

Error

Error refers to the *disagreement* between a measurement and the true or accepted value.

As with accuracy, you must know the true or correct value to discuss your error.

Uncertainty

Uncertainty of a measured value is an interval around the value such that any repetition of the measurement will produce a new result that lies within this interval.

Uncertainty, rather than error, is the important term to the working scientist.

For example: A student has measured the width of a standard piece of notebook paper and states the result as 8.53 ± 0.08 inches. By stating the uncertainty to be 0.08 inches, the student is claiming with confidence that every reasonable measurement of this piece of paper by other experimenters will produce a value not less than 8.45 inches and not greater than 8.61 inches.

A metal rod about 4 inches long has been passed around to several groups of students. Each group is asked to measure the length of the rod. Each group has five students and each student independently measures the rod and records his or her result.

Student Group	Student 1	Student 2	Student 3	Student 4	Student 5
Group A	10.1	10.4	9.6	9.9	10.8
Group B	10.135	10.227	10.201	10.011	10.155
Group C	12.14	12.17	12.15	12.14	12.18
Group D	10.05	10.82	8.01	11.5	10.77
Group E	10	11	10	10	10

1. Which group has the most accurate measurement?

Answer 1

UNKNOWN
True or accepted value is not known.
Any value is valid.

2. Which group has the most precise measurement?

Answer 2

GROUP C
Measurements are very close to each other.

3. Which group has the greatest error?

Answer 3

UNKNOWN
True or accepted value is not known, so error can't be determined.

4. Which group has the greatest uncertainty?

Answer 4

GROUP D
Larger variations within measurements.

9th B



Group 1

Rodrigo R.
Chiara
Chiara G.
Angelo
Gabriela

Group 2

Jimena
Alexis
Rodrigo K.
Paola
María Paula

Group 3

Romina
Grecia
Eric
Sharif
Sebastián

Group 4

Gonzalo
Atilio
Juan Manuel
Nadia

Group 5

Yael
Verónica
Valentina
Jorge

Group 6

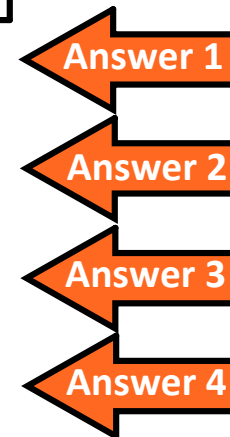
Solangie
Ana Paula
Rodrigo A.
Carolina

We now receive a report from the machine shop where the rod was manufactured. This very reputable firm certifies the rod to be 4 inches long to the nearest thousandths of an inch. Answer the questions below given this new information. Note that the questions are slightly different.

(4.000 inches = 10.160 cm).

Student Group	Student 1	Student 2	Student 3	Student 4	Student 5
Group A	10.1	10.4	9.6	9.9	10.8
Group B	10.135	10.227	10.201	10.011	10.155
Group C	12.14	12.17	12.15	12.14	12.18
Group D	10.05	10.82	8.01	11.5	10.77
Group E	10	11	10	10	10

1. Which group has the least accurate measurement?
2. Which group has the least precise measurement?
3. Which group has the smallest error?
4. Which group has the smallest uncertainty?



Scientific Method

Group 1

Alternative form of energy

Rodrigo R.

Chiara

Chiara G.

Angelo

Gabriela

Group 2

Discover life outside Earth

Jimena

Alexis

Rodrigo K.

Paola

María Paula

Group 3

Extend life of humans

Romina

Grecia

Eric

Sharif

Sebastián



Create freeze-resistant potato plants

Group 4

Produce stain-resistant cotton

Gonzalo

Atilio

Juan Manuel

Nadia

Group 5

Create freeze-resistant potato plants

Yael

Verónica

Valentina

Jorge

Group 6

Cure a rare disease

Solangie

Ana Paula

Rodrigo A.

Carolina

9th A



Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
Ma. Fernanda Cristian Nicole Micaela	Ariana Pedro Diego Gianluca	Sebastián Stefano Renzo José	Gonzalo Juan Francisco María Paula P. Juan Andrés	Luciana Carlo Gabriela Bianca	Yanira Daniela M. Carlos V. Daniela V. María Paula C.

We now receive a report from the machine shop where the rod was manufactured. This very reputable firm certifies the rod to be 4 inches long to the nearest thousandths of an inch. Answer the questions below given this new information. Note that the questions are slightly different.

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Group E	10	11	10	10	10

1. Which group has the least accurate measurement?

Answer 1

2. Which group has the least precise measurement?

Answer 2

3. Which group has the smallest error?

Answer 3

4. Which group has the smallest uncertainty?

Answer 4

Scientific Method

Group 1
Discover life outside Earth

Ma. Fernanda
Cristian
Nicole
Micaela

Group 2
Cure a rare disease

Ariana
Pedro
Diego
Gianluca
Brunella

Group 3
Produce stain-resistant cotton

Sebastián
Stefano
Renzo
José

Group 4
Extend life of humans

Gonzalo
Juan Francisco
María Paula P.
Juan Andrés

Group 5
Create freeze-resistant potato plants

Luciana
Carlo
Gabriela
Bianca
Andrea

Group 6
Alternative form of energy

Yanira
Daniela M.
Carlos V.
Daniela V.
María Paula C.



Lab Activity

Select 3 instruments and carry out a measurement.

Fill up the following table:

Student Group	Student 1	Student 2	Student 3	Student 4	Student 5
Group A					
Group B					
Group C					
Group D					
Group E					

Suggestions:

Mass - Scale.

Volume - Pipet, tube.

Length - Ruler, measuring tape.

Variables in Science experiments



VARIABLE

A variable is something that is changed.

CONSTANT

A constant, or control, is something that does not change.

<http://goo.gl/tdaFg>

Science experiments use...

INDEPENDENT VARIABLE

The one factor that is changed by the person doing the experiment.

DEPENDENT VARIABLE

The factor that is measured in the experiment.

CONSTANT

All the factors that stay the same in the experiment.

An example with a bird

If you want to find out if birds have a color preference for bird feeders...

What would be your hypothesis?



Red?



Blue?



Green?

Adapted from: <http://goo.gl/qHKqg>

About Constants and Variables

Independent Variable: color of the feeders.

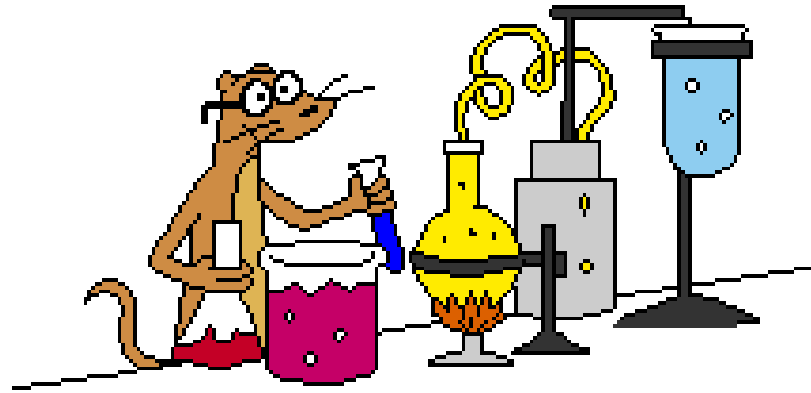
Dependent Variable: amount of seed eaten.

Constants: everything else that is kept the same, for example:

- *the location of the feeders*
- *the kind of feeder used*
- *putting the feeders out at the same time*



Experimental Design



If everything except the
independent variable is held
constant, we can say:

The experiment is FAIR.

Only the *variable*
can change.



Teacher's Notes

This class has been designed to cover the topics of *The Scientific Method* from Monday, March 8th till Friday, March 12th.

For further knowledge about this topic:

1. Conduct a thorough search under the topic: *The Scientific Method* on the Web, books and magazines.
2. If findings are not specific, ask your teacher for suggestions.

BACK

Objectives

- Explain the scientific character of any activity or discipline.
- Identify and apply the stages of the Scientific Method.
- Prepare and conduct a laboratory activity.

***Note:** All, or most, of the objectives will be covered during class time, however the student must be responsible for those objectives not covered or concluded.*

BACK

Vocabulary

- Science:
- Biology:
- Scientific Method:
- Hypothesis:
- Experiment:
- Spontaneous:
- Generation:

Note: *Most of the vocabulary words will be covered during class time, however the student must be responsible for those words not covered or concluded.*

BACK

Link and Learn

You can visit the following websites to improve your understanding on the present topic:

- <http://goo.gl/fkDv1>
- <http://goo.gl/oilUQ>
- <http://science-altair.wikispaces.com>
- <http://learningandscience.blogspot.com>

BACK

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